A search for exoplanets and close stellar/substellar companions in the local halo population

Sebastien Lepine
Georgia State University

We propose to expand the scope of the original Kepler mission by conducting a search for exoplanets orbiting the old and metal- poor stars of the Galactic halo, a population that was not observed to any significant degree in the first Kepler mission. Following the recent discovery of exoplanets orbiting Kapteyn's stars, a local halo M subdwarf, the stars of the Galactic halo population are now known to harbor exoplanets as well as those of the Galactic disk. However, very little is currently known about the prevalence and properties of the exoplanets in the halo. Our astrometric and photometric analysis of the fields to be observed in campaigns 4-5 of the Kepler K2 mission have identified 1,957 high-velocity subdwarfs that are nearby members of the Galactic halo. We propose to monitor these halo stars with Kepler, to identify and characterize a statistically significant number of the first generation of exoplanets in our Galaxy. Light curves of the targeted halo stars will be searched for eclipses or transits, following the methodologies developed in the first Kepler mission. Candidates will be targeted for ground-based, follow-up observations to confirm the existence of the transit, and determine if it is from a planet of from a stellar companion. The detection of eclipsing stellar companions would also be of high interest for stellar astrophysics, as it would provide natural calibrators of the mass-radius relationship; while this relationship is critical to constrain models of stellar structure, such calibrators currently do not exist for low-mass, metal-poor stars.